NEWSLETTER

Volume 20 Number 3 December 1982

Registered by Australia Post
Publication No. TBG 0734

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Australian Society for Limnology

The **Australian Society for Limnology** is an association of over 400 people with professional and amateur interests related to Australian inland waters. Since its inception in 1961 the Society has played an important role in fostering limnological work in this country. The ASL promotes liaison between limnologists in academic, private and govermental institutions and has a vested interest in the conservation of aquatic and related resources. Annual conferences are held near centres of limnological interest, and the programme includes scientific sessions, field excursions and social activities.

The ASL produces a **Newsletter** with notes on activities, articles of general interest, book revies and conference announcements; a **Bulletin** of original scientific papers and occasional **Special Publications**. A further publication is the **Directory of Australian Limnologists.**

Membership applications are welcomed; four classes of subscribing membership are available:

Ordinary members:	$10.00
Student members:	$4.00
Institutional members:	Fees on application
Sustaining members:	Fees on application

Members are entitled to receive the Australian Journal of Marine and Freshwater Research at the reduced rate of $18.00 p.a.

Membership subscriptions cover the period 1 July to 30 June but subscriptions for A.J.M.F.R. cover the period 1 January to 31 December.

Enquiries relating to membership to:

Mrs Margaret Hart,
Secretary/Treasurer, ASL,
22 Netherby Avenue,
Mulgrave, Victoria,
Australia 3170.

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Vice-President: Barry Hart

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News &Views

SUBSCRIPTIONS

A request for your 1982/83 subscription accompanied the last issue of the Newsletter. If you haven't already done so, please get a cheque to Margaret Hart as soon as possible. Reminders take time and money!

GREMLINS AT WORK

You will have noticed that the information sheet on the reverse of the title page was missing from the last issue of the Newsletter. It was typed up and went to the Printers; it hasn't been seen since! Hopefully, it will appear in this issue.

FROM GRIFFITH TO GRIFFITH!

It was decided at the 1982 Griffith Conference that the 1983 A.S.L. Conference will be held at Griffith University in Queensland. The dates are 20-23 May 1983. The organizer is Angela Atherington. Further details will be circulated to members shortly.

JOLLY AWARD TO BARRY HART

The Jolly Award went to Barry Hart at the Griffith Conference. The eulogy given by Sam Lake follows:

'This year, as in the previous three years, we have a successful nomination for the Award. The Committee has unanimously decided that the Jolly Award be given to Dr. Barry Hart.

Barry is now Executive Director of the Water Studies Centre at the Chisholm Institute of Technology. The Committee thinks that it is in three areas of endeavour that Barry has made significant contributions to Australian limnology.

Barry has furthered our understanding of the behaviour of inorganic elements and compounds in our water bodies, with particular emphasis on heavy metals. And unusually for a chemist, not only for this work has he worked on field situations, but he has often displayed an awareness of the biotic implications of the chemical phenomena.

In the area of applied limnology in Australia, Barry has been a forceful leader. He has lead the way in inducing water management authorities to look beyond the setting of water quality criteria for potable and commercial purposes and to realize the importance of establishing water quality criteria to protect aquatic ecosystems. His "Water Quality Criteria" of 1974 is a key work. This work and subsequent ones on water quality reveals a perceptive and versatile mind capable of getting to the core essentials of a huge amount of seemingly unrelated papers on subjects ranging from agricultural science through to fish biology.

The Committee feels that Barry has made a very significant contribution to Australian Limnology in the development of limnology as a tertiary subject. In particular we have in mind the development of the Water Studies Centre at the Chisholm Institute of Technology. This centre has been developed as a result of Barry's enthusiasm, determination and drive. In the context of a university such a development would be a massive undertaking but in the context of a College of Advanced Education such a task has an amazing one - a super-Herculean one.

Finally Barry and his wife Margaret have both been diligent and hard-working members of the Executive of A.S.L. and have fostered the recognition of A.S.L.'s efforts and concerns in new professional areas.

So for these reasons, on behalf of the Australian Society for Limnology, the Jolly Award Committee has much pleasure in presenting the Jolly Award to Dr. Barry Hart.'

NEW BOOK ON W.A. INLAND FISHES

A book entitled 'A Field Guide to Inland Fishes of Western Australia' by Gerry Allen has been published. The book gives detailed descriptions of the 55 Western Australian freshwater fish species. Over 40 other species are described in more general terms. There are more than 60 colour photographs. The price is $10.65 ($11.95 by post from the Western Australian Museum, Perth). It is hoped to review this book in a later issue of the Newsletter.

WHY NOT WRITE FOR THE NEWSLETTER?

Bound into the centre of this Newsletter is a form which is hoped members will complete to provide information for inclusion into the Newsletter. Obtaining enough copy for the Newsletter is a problem experienced by all editors. The Newsletter is the 'house journal' of the Society - please use it as such.

A.S.L. MAKES STATEMENT TO PRESS

Following the 1982 Conference the Society issued the following media release.

AUSTRALIAN SOCIETY FOR LIMNOLOGY - FRESHWATER RESEARCH IN AUSTRALIA

At its recent annual general meeting in Griffith, the Australian Society for Limnology (limnology is the study of freshwaters), an organization vitally concerned with the management and research of Australia's freshwater resources, passed a resolution in support of the "Institute of Freshwater Studies Bill 1981" introduced into Federal parliament by Mr. R. Jacobi, the member for Hawker, South Australia. This bill, which aims to establish an Australian Institute of Freshwater Studies to upgrade and extend the research and planning of freshwater resources, was initially rejected by the lower house, but has more recently been supported by the Senate and is now back with the House of Representatives for further consideration.

Such a national research institute would concentrate on studying the many problems in need of detailed limnological research in Australia, including salinity in the Murray, eutrophication (excessive weed growth) of lakes and reservoirs, and pollution by toxic metals such as copper and zinc.

There is a totally inadequate water research effort in Australia, despite our continent being amongst the driest in the world. Currently the amount spent on water research is less than 1.5% of the total annual capital expenditure by the Australian water industry. In Canada and South Africa the comparable figure is almost 3% and in the United States is 4%. Australia would need to commit around $30 million annually to water research to be comparable to canada. This comparison is all the more revealing when it is considered that Canada is a country having ample water supplies in direct contrast to arid Australia.

In Australia, the CSIRO spends most on water research - in 1979 the figure was around $4 million or 25% of the amount spent Australia wide. Despite this large financial commitment, the CSIRO water research program has been strongly criticized as being too widely spread through the organization without any obvious focal point, being out of touch with many of Australia's most pressing needs, and lacking almost completely any commitment to limnological research.

Largely in response to this criticism, the CSIRO executive recently made water one of its priority research areas for the future. Despite this there is still little evidence that any major changes have occurred in CSIRO that will result in a greater limnological component in their water research effort.

In addition to the "Institute for Freshwater Studies Bill 1981", the Federal government is presently considering the recommendations of an Australian Water Resources Council working group on water research in Australia. This working group strongly recommended an increased expenditure, to approximately $30 million annually, on water research.

They did not support a National Freshwater Research Institute but rather saw the additional research being covered by an increased commitment from CSIRO and, if CSIRO did not undertake more limnological research, the establishment of five "Centres of Concentration" in identified areas such as water quality criteria, aquatic ecology and tropical limnology.

Whichever of these alternatives the government finally decides upon, it is clear that action must be taken urgently to increase water research in Australia.

Further details may be obtained from:

Dr. Barry T. Hart,
Vice President, Australian Society for Limnology,
C/- Water Studies Centre,
Chisholm Institute of Technology, Caulfield East.
Phone: (03) 573 2326

A NEW AUSTRALIAN JOURNAL

Reports of the National Museum of Victoria is a new series being produced by that institution. Its aim is to allow publication of (often) larger papers, which may be factual rather than interpretive, or may be of special interest in the Australian context.

It is likely that many issues will be of interest to Australian limnologists. Number one, published in February 1982, contains a long paper on the benthic invertebrates of the Thomson River, Victoria, by M. Malipatial and J. Blyth. At least four more issues over the next two years will include: an annotated bibliography of Australian Trichoptera; reports of both the long running Dartmouth Invertebrate Survey, and of the Latrobe Catchment Invertebrate Study; results of a detailed analysis of bed type, sediment levels and current speed upon invertebrates of the Thomson River.

The report series can be purchased at $6 per copy from The Administration Officer, National Museum of Victoria, 275-321 Russell Street, Melbourne, 3000. Alternatively, a standing order can be placed, and you will be invoiced on receipt of each issue.

CHINESE EXCHANGE AGREEMENT

Applications are invited from scientists wishing to participate in the 1983/84 Australian Academy of Science - Academia Sinica scientific exchange program.

Intending applicants should have a specific program or project in mind, preferably one that has been developed in consultation with the institutes they wish to visit. Documentary evidence of Chinese interest and support will greatly strengthen the application.

Applications may be made for short visits (3 to 4 weeks) or for a longer term to carry out research projects or field studies. Preference will be given to proposals for visit designed to deal with topics in some detail, although proposals with broader objectives are not excluded, particularly where exploratory visits have not yet taken place.

In making its selections the Academy will be influenced by the following considerations:

a. any special features of the proposal which make it logical for it to be carried out in China rather than in some other country;

b. its scientific merit;

c. the potential for developing further collaboration;

d. the interest it is likely to arouse amongst scientists in similar fields of research in Australia, and

e. evidence of support for the proposal from within China.

It should be noted that problems, and delays, may arise in arranging visits to institutes not under the control of Academia Sinica. Applicants should therefore concentrate on programs in which Academia Sinica has a direct interest.

Under the terms of the agreement travel expenses to China are Australia's responsibility and expenses within China the responsibility of Academia Sinica. No stipends or allowances are paid, nor provision made for return hospitality to Chinese hosts.

Application forms and a list of the Institutes of Academia Sinica are available from the Australian Academy of Science, P.O. Box 783, Canberra City, ACT 2601. For visits in the 1983/84 financial year early application is requested, as a considerable lead time is required.

WATER RESEARCH GRANTS

The Commonwealth Government has decided to expand Australia's water research effort through the establishment of the National Water Research Council.

The Council will advise the Government on national water research goals, needs and priorities, maintain an overview of water research throughout Australia and recommend on funds for research and development projects.

It is also evaluate research and demonstration programs and projects, and advise on an effective program of technology transfer from the research and development sector to users.

Advertisements seeking applications for research grants from the National Water Research Council are likely to be placed in the national press by the Department in mid-November 1982. It is envisaged that the first round of applications will be assessed by the Council early in December 1982.

As further details become available, organizations will be advised.

MONO LAKE, AN OASIS IN DANGER

Earlier this year Bill Williams and Patrick De Deckker visited North America where they spent some days visiting Mono Lake, a large saline lake in California, which lies east of Yosemite National Park. This beautiful region is unique in the world. Its visual grandeur, spectacular bird concentrations, and unusual geologic features are an irreplaceable part of natural heritage of North America.

Today Mono Lake is shrinking because its tributary streams are being diverted southward by the Los Angeles Department of Water and Power. Since diversions began in 1941 the lake has fallen 44 vertical feet, its area has been reduced from 88 square miles to less than 60, and its salinity has doubled. The lake level currently falls nearly two feet per year.

In 1977 the shrinking lake exposed a shoal of alkali lake bottom that stretched two miles from the mainland to Negit Island, site of the largest single California Gull rookery in the world. The presence of the landbridge allowed predator access to the island and resulted in the abandonment of the rookery in 1979, 1980, and 1981. Caustic dust clouds, swept by wind from the exposed lake bottom, now foul the once pristine Eastern Sierra air.

The abundant brine shrimp that provide food for millions of migratory and nesting birds are threatened by the increasing salinity. Should the shrimp population collapse, a large percentage of the world's Eared Grebes, Wilson's and Northern Phalaropes, and California Gulls would perish. The survival of Mono Lake's ancient ecosystem is in serious jeopardy.

There is an alternative to this man-made tragedy. In 1979 a state, federal, and county interagency task force recommended that the level of Mono Lake be allowed to rise by reducing diversions and implementing a program of common sense water use in Los Angeles. Their recommendations included recycling wastewater for industry and irrigation and installing low cost efficient water fixtures in homes.

These measures would save more than enough water to preserve Mono Lake for future generations.

Australian limnologists who want further information about this lake or who would like to join the Mono Lake Committee (a sliding scale of contributions is available) should write to Mono Lake Committee, P.O. Box 29, Lee Vining, CA 93541.

Joachim Illies 1925–1982

Joachim Illies, an internationally-known freshwater biologist, and known personally to many members of the A.S.L. because of his visit to Australia in 1966 and their visits to his laboratory in Germany, passed away on the 3rd June 1982. An expert linguist, fine companion, and a friend and colleague to many young (and old) Australians, he will be sadly missed.

Born at Ketzin in 1925, his early years were spent in Berlin, but, after the war, he studied at the Universities of Gottingen and Kiel. Using privately obtained funds he and some colleagues founded their own research laboratory (is there a message there for us?), and this later became part of the Max Planck Gesellschaft series of laboratories. Most of his later working life was spent at the limnological laboratory at Schlitz, near Frankfurt, which he directed from 1951–1958, and 1965–1982.

The insects of running waters were the focal point of his aquatic interests, and in pursuit of these he visited us in 1966. Then he was searching mainly for stoneflies. Visits were paid to numerous parts of Australia, and he was hosted by many A.S.L. members. Most of them will remember him as an ebullient, dynamic and lively colleague with an excellent mastery of strine and a highly developed sense of fun. He was a delight to be with in the field (and his driving was unforgettable). In a world of grey and brown hues, he will be sadly missed. Certainly I shall miss him, and cannot forget his many kindnesses to me and my family. Vale Joachim.

W.D. Williams.

Book Reviews

Fundamentals of Aquatic Ecosystems
Eds. R.S.K. Barnes and K.H. Mann.
Blackwell Scientific Publications ISBN 0-632-00014-7, 229 pp. Paperback.

Reviewed by Alastair Richardson.

As an undergraduate in the 60's, I attended a Third Year course in Hydrobiology, which at the time seemed hopelessly general, dealing as it did with the sea and the streams of Dartmoor in the same breath. But since then the common factors between aquatic habitats have become more obvious to me, and this book, which starts from the premise that there are more factors in common between aquatic habitats than there are contrasts, is an attempt to revive hydrobiology.

In these days of specialization, this is a laudable aim, and one which the book largely achieves, but the readership of this journal had better note that the attention given to freshwaters is roughly in proportion to their representation on the globe.

Barnes and Mann have collected together a group of chapters by a talented range of authors which deal mainly with production and nutrient cycling. As in any such multi-authored volume, the quality of the contributions varies, but generally the standard is high, and the authors are to be complimented in their attempts to write specifically for their target group, that is undergraduate students. I have used the book as a reference for First Year students, and they found it a useful source of information for a comparison of terrestrial and aquatic ecosystems, a theme which the book returns to several times.

The writing is rarely stuffy and occasionally original. I liked Pomeroy's picture of microbial decomposers living 'in gingerbread houses', and zooplankton consuming cells of the right size 'like so much popcorn'. And the case of the deep sea sandwiches from the Alvin makes a novel illustration of the importance of invertebrate shredders in decomposition. Odum enquires when

his readers last ate tiger steak or wolf-burger in order to illustrate how our terrestrial food sources are derived almost entirely from the herbivore level or below.

Some of the chapters are less successful. I was uninspired by Fogg's chapter on primary production, and the final chapter by Woodwell seems to have strayed in from some other book, it is so out of tune with what goes before. The book could usefully have closed with the chapter by Mann on the Total Aquatic System.

As a summary of ecosystem processes in aquatic systems, the book is successful, but in a book aimed at an undergraduate audience, it is disturbing to see, in Parson's chapter on zooplankton, the use of such confusing symbols in equations to describe the energetics of feeding (R = ration consumed; T = respiration). It would surely have been desirable to use IBP symbols, especially when the same author uses R for respiration on the following page! This sort of thing, and the occasional use of slashes, rather than superscripts in describing units (kg dry wt/m^2/yr) can only confuse in a textbook, and should have been edited out.

Perhaps my main quibble with the book is the overall assumption that a description of the movement of energy and nutrients in an ecosystem is necessarily a complete description of that system. When discussing the maximum sustainable yield of fisheries, Odum has to point out that the size of each individual packet may be of more importance to the fishery than the total amount of energy which it yields. And in his closing chapter, Mann uses as an example his work on the kelp beds of the east coast of Canada. However, the well-known catastrophic changes which take place in those communities when the controlling effect of lobster predation is removed are <u>not</u> predictable from a detailed study of the energetics of the community. Mann describes as "strange, and alarming" the fact that the urchins can bring about such large-scale changes when the 'ecosystem' figure for their consumption of kelp is a mere 3%, but only goes to illustrate that the energetics approach is not in any sense a complete description of a community.

In conclusion, the book is useful summary of the production approach to aquatic ecosystems for an undergraduate audience, and its strengths are the quality of the summary, and the emphasis on the unity of aquatic systems. But it is a pity, and almost old-fashioned, that the energetics approach should have been presented as the ultimate and only way of studying ecosystems.

An Atlas of Distribution of the Freshwater Fish Families of the World

Tim M. Berra

University of Nebraska Press, 901 North 17th Street, Lincoln, Nebraska 68088. ISBN 0-8032-1411-1 197 pp. Hardback US$26.50 (13.4¢ per page); paperback US$12.50 (6.3¢ per page).

Reviewed by R.W.G. White

Many members will have met Tim Berra when he visited Australia on a Fulbright Fellowship in 1979. He attended the Tallangata Conference and presented a paper on his atlas project. The book reviewed here results from this project. "An Atlas of Distribution of the Freshwater Fish Families of the World" is a handsome publication. With 197 pages and a large format it represents excellent value at $26.50 for the hardback edition and just $12.50 for the paperback one. If only prices like this prevailed for books produced in Australia! (The prices given here are in US dollars).

After a lucid and supportive 'Preface' by Bob McDowell there is a nine page 'Introduction'. This starts with a brief section entitled 'What is a Fish?' This is not such a stupid question when you appreciate that the vernacular name 'fish' covers at least three quite distinct classes of chordates. Berra then goes on to group fish families into primary, secondary and peripheral divisions. Primary division fish families are restricted to freshwater and have little salt tolerance. Secondary division fish families are those whose members are usually confined to freshwater, but they have some salt tolerance which may permit dispersal along coasts or across short distances of salt water. Peripheral division fish include those derived relatively recently from marine ancestors and those which still spend a significant proportion of their life in the sea.

The rest of the introduction is concerned mainly with distribution patterns and their causes. It concludes with a half a page on the pronunciation of family names. Ten simple rules are listed and the reviewer, who frequently fails to wrap his tongue around a scientific name at a critical point during a lecture, has resolved to commit them to memory.

There follows 158 pages of the atlas proper. There is a one page entry for each family. Each includes a full classification from class down to family, the phonetic spelling of the family name, the family's vernacular name, a line drawing of a typical representative and a map of the World with the families distribution shaded. A text entry then indicates the morphological characterization of the family, the number of species, some brief biological notes and references to sources of further information. Each family entry concludes with the references from which the distribution patterns were obtained.

Of course, the text entries range greatly in length from family to family. This reflects the variable amount known about each family. The book concludes with a glossary, a compendium of principal rivers and lakes of the World, a geological time chart, a list of fish articles published in the National Geographic Magazine and Scientific American, and a full bibliography.

There are very few typographical errors and factually it appears to be tight. There are some statements which, because of the need to write in a very concise way, the author may have been misleading. For example, the statement that Galaxias maculatus is "the only galaxiid to breed in brackish water" may be correct for those few members of the family for which the life history is known but cannot be accepted when the reproductive strategies of many riverine specieshave yet to be investigated.

This is a highly recommended book. It has much to interest the fish biologist and sells at a price which means that there is a good chance it will appear in his personal library as well as his institution's one.

Finally, what a pleasure it was to open the package from the American publisher to be greeted by a familiar fish, Galaxias maculatus, on the dust cover.

Abstracts of Theses

The environmental effect of flood mitigation works with particular reference to the estuarine situation.

William N. McGregor

Master of Environmental Studies 1979, Macquarie University.

The excess of $60 million has been spent on flood mitigation in coastal areas. After 16 years of sustained construction effort decision makers are re-assessing future flood mitigation policy. In 1969, economic feasibility was introduced as a criterion to be satisfied in project evaluation. Despite the introduction of general environmental legislation and adoption of a policy of consultation with responsible authorities viz. National Parks and Wild Life Service and State Fisheries environmental considerations have received inadequate weighting in project design and assessment. This study highlights the lack of basic research data and any retrospective examinations of environmental performance.

The investigation focused on environmental effects in the estuarine situation associated with drainage and the construction of floodgates. Ironbark Creek - Hexham Swamp was the area chosen and a comparison of constrained tidal flushing to total exclusion was undertaken. Despite an interchange of less than 1/6 of that existing before gate construction salinities up to 20% were recorded 4 km. upstream. A strong saline wedge was also maintained despite turbulence at the gates. Closures of the gates led to a doubling of total Phosphorus and Ammonia-N concentrations at downstream stations. Temperature was little effected but tidal flushing tended to stabilize dissolved oxygen concentration around acceptable levels. No pronounced response to closure was seen in Chlorophyll-a concentrations and phytoplankton populations appear to be controlled by freshwater flushing.

At the experimental level of flushing juvenile fish utilized downstream areas above the gates but penetration upstream was limited. Amongst larger fish caught in gill nets only certain species penetrated the opened gate. Three species appeared unable to negotiate the gates. All the above

conclusions were shown to be significant by analysis of variance tests. Further the catches in gill nets were all commercial species and most, for which information exists, are estuarine dependent.

Commercially significant school prawns (Metaphenaeus macleayii) were able to pass the opened gate but upon closure no significant numbers were found upstream. Benthos sampling showed a contraction in polychaete taxa after closure but biomass was maintained.

Gate closure led to colonization by aquatic weeds Eichornia crassipes and Salvinia molesta. Also other fresh to brackish water aquatic macrophytes become established. The construction of gates has led to mangrove debilitation and a contraction in mangrove areas by clearing and natural dieback. Water potential and salinity measurements on mangroves reveal physiological stress related to changed water regimes. Mangroves affected by flood mitigation works show reduced litter fall and litter degradation rates in comparison to healthy stands nearby.

The effects of mercury, copper and cadmium on selected autotrophic organisms.
C. Sorentino
Master of Environmental Studies 1979, Macquarie University.

Photosynthetic algae are the most important primary producers in aquatic environments. According to Cushing (1975) they practically provide the totality of the food for the oceanic ecosystems. As such, algal productivity affects the population of all the other trophic levels. They not only constitute a source of energy, but also of micro-nutrient algae are able to absorb and concentrate trace elements, including heavy metals, from the surrounding waters.

In general heavy metals are toxic to most life forms; so much so, that it has been argued that their presence in the primitive oceans prevented the diversification of life for most of the Earth's biological history (Fyfe, 1977). The continuous discharge of chemical wastes into aquatic systems is of considerable concern: If, as suggested by Nuzzi (1972), even very minute amounts of heavy metals can reduce photosynthetic productivity, there is a serious long term threat to the health of aquatic systems.

These considerations have attracted some attention to the question of the effects of heavy metals on algae. (see Section 1.2)

The objectives of this research are:

a) To develop an algal biomonitoring system able to detect the subchronic effects of these metals, and

b) to study the effects of mercury, copper and cadmium on selected algal species.

An environmental planning study of the Macquarie River and its floodplain at Bathurst, N.S.W.

Janet M. Brett

Master of Environmental Studies 1979, Macquarie University

The Macquarie River and its floodplain at Bathurst, N.S.W., are significant features of the area and are of considerable value to the community. Both features experience strong demands for various and sometimes conflicting forms of usage and as the city expands, the river and floodplain will to an increasing extent become the focus of the city.

An evaluation of the existing economic and resource capabilities of the study area is made, supplemented by documentation of governmental policy regarding floodplain development and an assessment of the existing and potential demands on the area.

A multi-objective planning framework is used to evaluate this data in terms of the likely costs and benefits of implementing each of the five alternative land-use plans reflecting various emphases across the spectrum of economic development, environmental quality and social well-being. The formulated plans range from large-scale residential/industrial development through to large-scale recreational development, with three intermediate plans containing varying allocations and combinations of competing land uses. The five plans are assessed in terms of economic, environmental and social planning objectives and on this basis a plan is selected that provides the greatest degree of benefit to the community for the particular costs involved.

The uptake of heavy metals by aquatic plants.

Patrick McBride

Master of Environmental Studies 1980, Macquarie University.

A literature search was carried out for the uptake of heavy metals by aquatic plants. Very little information was found to be available directly on the topic and material on land plant uptake was included to cover aspects expected to be similar.

This thesis explores the cycling of heavy metals from sediment to water by plants as a means whereby contaminants locked in otherwise stable forms in sediment may be returned to the aquatic ecosystem. Original work was carried out on mangroves growing in the Parramatta River system, determining the levels of cadmium, chromium, copper, lead and zinc contained in the leaves, aerial roots and associated sediments.

Even though the levels of copper, lead and zinc were significantly higher than at an uncontaminated area, an estimate of the annual input of these metals by leaf fall showed the resultant increases in water concentrations to be very small.

Significant correlation was found to exist between the plant and sediment concentrations of chromium, lead and zinc, suggesting that mangroves could be used as indicator species for heavy metal pollution in rivers and estuaries.

Uranium tailing disposal - Ranger Project - a rationale.

Michael Haylen

Master of Environmental Studies 1981, Macquarie University.

The Ranger Uranium Environmental Inquiry Second Report (May 1977), made the binding recommendation that Ranger's tailings shall be disposed of in the worked-out mine pits. In 1978 the Australian Government decided, on the basis of present knowledge, to accept this recommendation but it is now subject to review in or after 1989.

This study is designed to examine the potentially adverse impacts resulting from disposal of Ranger's tailings in the tailings dam as opposed to disposal in the mine pits, based on information available at April 1981. The rationale includes identification and assessment of the following: seepage

losses from tailings dam; an interpretation of hydrogeology; long term radon emanation from tailings; long term stability, reclamation/aesthetics; and the Aboriginals' preference.

In assessing the potentially adverse physical impacts, a qualitative comparison or risk is used where risk is defined as a function of the probability of occurrence of an adverse consequence and the magnitude of that consequence.

It is concluded that the long term physical environment would be better protected and the concept of "Best Practicable Technology" is more compatible with disposing of Ranger's tailings above-grade (ground) in the tailings dam. This option is preferred to below-grade (ground) disposal in the mine pits, mainly because the risks for groundwater contamination and subsequent surface water contamination are determined to be greater for pit disposal. The risks resulting from other physical impacts, associated with above-grade and below-grade disposal, are determined to be low.

If it can be demonstrated to the traditional owners (Aboriginals) satisfaction, that their land will be better protected by disposing of tailings by some means other than transferring them to the pits, the alternative could very well be acceptable to the traditional owners. From the rationale of physical impacts it can be demonstrated that the Aboriginal's land will be better protected by not disposing of tailings in the mine pits.

It is considered that the estimated performance of Ranger's saturated tailings management system is compatible with the concept of "Best Practicable Technology". If an additional tailings dam is required at Ranger, the most suitable site is located immediately south of the present dam. Ranger's consultants propose to construct an 80 ha evaporation pond at this site (once the need is established). Design criteria for such a pond should include the option for conversion to a tailings impoundment. It may prove economically and environmentally preferable to adopt a modified version of the semi-dry technique for tailings management at this site, thereby alleviating the need for a separate evaporation pond.

A study of phenotypic variation in Daphnia in south-eastern Australia.

J.W.G. Grant

B.Sc. Honours (Zoology) 1979, Monash University.

Laboratory studies indicated that crest growth in"cyclomorphic" Daphnia in south-eastern Australia was cued directly by a chemical secreted by Anisops spp. a major predator upon Daphnia. Whether or not this reaction by the Daphnia is confined to this genus of predators is not known.

A helmet holds a considerable advantage against notonectid predation for a Daphnia.

Correlations of Daphnia species distributions indicated that those species which grow only small crests will be limited by predation. The phenomorphic types are distributed independently of predators and the permanently crested type is often excluded from water bodies with low Anisops densities.

These aspects of the biology of Daphnia have hitherto been neglected, the most significant finding being the first record of a biotic environmental cue for crest growth in Daphnia.

Such cueing may be acting on a broad scale so that some previous investigations may merely represent a study of secondary or peripheral factors.

Diel density patterns of the rock and drift fauna of the Toorongo River, near Noojee.

Anne Graesser

B.Sc. Honours (Zoology) 1980, Monash University.

The aim of this study was to establish whether the densities of the rock.fauna show a diel periodicity which could be correlated with the drift densities of the benthic fauna. Samples of the drift and rock fauna of the Toorongo River, near Noojee were collected at regular intervals throughout four 24 hour periods. In this study the densities of the rock fauna exhibited a diel periodicity, which was negatively correlated with the diel density pattern of the drift fauna.

The drift fauna consisted of more taxa than just those recorded in the samples of the rock fauna. Faunal samples were collected from substrata with a range of particle sizes to determine the source of the other taxa identified in the drift samples. The distribution of the benthic invertebrates, was analysed to examine the influence of particle size. The distribution of most of these benthic invertebrates were not closely associated with the distribution of particle sizes.

In previous studies, the composition of the substratum has been shown to influence the micro-distribution of the benthic fauna. Consequently the influence of the substratum on the entry of the benthic fauna into the drift was investigated. Three types of substrata were used in the substratum enclosures; these were rocks, rocks and gravel, and gravel. It was found that the substratum can influence both the density and the composition of the fauna drifting from each substratum type.

Emergence and development of aquatic invertebrate communities from dried mud after flooding.

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Factors affecting the emergence and survival of temporary pond invertebrates (temperature, profile level, desiccation, insect colonization and predation) were investigated by experimental studies on dried mud obtained from a pond near Colac, south-western Victoria. The results were compared with field samples from the same pond after flooding.

Controlled temperature experiments showed the emergence of microcrustacea to be greater at 18°C than it was at 10°C. Emergence at 10°C 18°C fluctuating was intermediate between the two. There was some evidence for species specific temperature preferences, particularly in Alona davidi and Simocephalus expinosus* for 18°C. Investigations of emergence from different profile samples indicated that invertebrate resting stages were concentrated in the lower (0-40 cm profile) portions of the pond basin.

An absence of cyclopoids, harpacticoids and amphipods after periods of drying, indicated a lowered resistance to desiccation. Calanoids were not affected until severe desiccation (36 days at 20°C) caused a reduction in numbers. Conversely, species of Cladocera, particularly Daphnia carinata and

Ceriodaphnia quadrangula, exhibited marked increases in population densities after periods of desiccation. The time of occurrence and developmental stages of all species were recorded.

Large numbers of aquatic Coleoptera and some Hemiptera were observed to be buried in the moist soil of the pond basin. Their persistence in the mud was found to be directly related to the period of desiccation of the mud. It is proposed that this phenomenon might be a common occurrence in temperate ponds, particularly those with short dry periods.

Colonising non-predaceous insect larvae were observed to have an indirect effect on the developing communities. The greatest effect was the inhibition of excessive growths of Spirogyra which permitted greater population increases than in baths where insect colonization was prevented.

The effect of insect predators was determined experimentally and by comparison with field studies. Selective predation on the Cladocera and most particularly on the smaller species was evident.

The production of ephippia by Daphnia carinata was synchronous in experimental baths despite differences in treatment.

Field and laboratory studies of predator induction of crests in Daphnia carinata S.L.

M.J. Barry

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The effect of notonectid predation on a population of Daphnia in a controlled semi-natural environment were studied. The size of the Daphnia population varied inversely with increasing notonectid density. Crest size was positively correlated with predator density, suggesting that crest induction was not an all or nothing type response.

Laboratory studies indicated that a crest induction factor was produced by all Anisops spp. and the one species of Enithares that were tested. Morphs of D. carinata differed in their ability to respond to the same species of notonectid. In this study, non-notonectid predators did not induce crests in D. carinata.

The results of a behavioural study supported the suggestion of O'Brien and Vinyard (1978) and Grant and Bayly (1981) that helmets reduced the efficiency of notonectid predation. The effect of the helmet varied,

depending on the species of notonectid and the size and variety of Daphnia carinata. The crest acted primarily to increase predator avoidance rather than as an anti-lock device.

A comparative life table study of an ecophenotypic and a permanently crested morph, suggested that the presence of a crest was associated with reduced fecundity. The growth rate of the permanently crested morph during this experiment was slower, although its intrinsic mortality was considerably higher.

Field measurements suggested that predator numbers, rather than oxygen stress, may be more important in determining an observed correlation between permanently crested cephalata and ponds rich in macrophytes.

Some laboratory and field studies on the dynamics of small aquatic ecosystems, with particular reference to the role of predation.

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Studies of laboratory microcosm communities derived from dried sediment taken from a temporary pond, were conducted to assess the influence of introduced predators (Notonectidae: Anisops deanei). A number of variables were monitored, including the composition of the biota and the major physico-chemical parameters. Factor analyses of the data suggested that predation may have a major impact on the biota of developing cultures. It was suggested that the important of predation was due, at least in part, to a close relationship between A. deanei, time, Boeckella symmetrica, large phytoplankton, filamentous algae and temperature.

These associations were tested in subsequent manipulative experiments and found to be largely consistent with those predicted by the model suggested by Hurlbert et al (1972). It is proposed that B. symmetrica, by grazing on large phytoplankters, may facilitate a rise to dominance of filamentous algae. This change in the structure of the algal community may, in turn, have a deleterious effect on the diversity and abundances of the plankton. The predatory control of B. symmetrica numbers may underly the unexpected finding that predation may allow prey species to survive in greater numbers. The role of temperature in influencing the competitive balance between the phytoplanktonic and the dominant filamentous algae, and the suggested

importance of the timing of the introduction of predators were not included in Hurlbert et al (1972) analysis, and may enable a greater understanding of the role of this association in natural temporary pond communities.

The importance of interactions between the animals and the plants within these cultures has been suggested in studies of other communities and questions much of successional theory that emphasise competitive relationships.